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# Indian Museum Notes

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Vol. II.]

[ No. 6.

A CONSPECTUS OF THE INSECTS WHICH AFFECT CROPS  
IN INDIA<sup>(1)</sup>.

[*N.B.*—In the following conspectus the words *large*, *small*, *minute*, etc., as applied to insects, are merely intended to indicate their relative size as compared with other species in the same order.]

THE following conspectus, which has been drawn up by the direction of the Trustees of the Indian Museum on the suggestion of the Government of India, com-

Contents.

prises the insects and mites which have, up to the present, been noted as attacking crops in India. To complete the subject the parasitic species have been included, as some of them are of great importance to Indian agriculture, on account of the wonderful effect which they have in keeping down injurious insects. The list is as complete as it has been possible to make it in the present state of information on the subject, but much of it will no doubt require modification, and a large number of additions will have to be made when further investigation comes to be instituted in the field. The species have been arranged in the first instance in zoological order, so that the ones which are related to each other in structure and habits may be placed side by side. In accordance with a suggestion made by the Government of India, tables have been added in which the primary arrangement is accorded to the plants and other products attacked by the insects. These tables are divided under the headings of—I, Agricultural plants and produce; II, Forest and fruit-trees and their produce; III, Miscellaneous. They are likely to prove useful for purposes of reference, but it should be noticed that they are necessarily very incomplete; for what is at present known on the subject of insect pests in India is chiefly derived from the reports and specimens that have been sent to the Indian Museum by people who, with few exceptions, have no special knowledge of entomology. The chief object of the senders, in the great majority of cases, has been merely to learn the name of the insect and to secure any information that might be forthcoming in the Museum on the subject of the best practical methods of dealing with it. Except, therefore, in cases where subsequent attacks of other crops, by similar insects, have happened to offer special features of fresh interest, the information received has generally related to the attack of the crop on which the insect was first noticed. The result is that, while the conspectus will probably be found to contain references to the majority of the insects which have lately proved destructive to

(1) Help with the botanical names of the plants referred to in this paper has been most kindly afforded by Mr. J. F. Duthie, Director of the Botanical Department, Northern India

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any very large extent in India, it is certain to be very deficient in the list of crops and other products which these pests attack. This defect is being gradually remedied as information accumulates, but progress is necessarily slow.

The habits of many of the insects that are recorded in this conspectus have been more or less completely traced in India, and the number of such species is constantly increasing. With regard to the remainder, although little has been done in observing them in India, yet, in the great majority of cases, a good deal is known as to the main features of their habits; for almost all of them are allied to, and some of them are actually identical with, species which have been kept under observation in other parts of the world. It is true that in some instances closely allied species are found to have very different habits, but the cases where this is likely to happen are fairly well known, so that upon the whole it does not seriously interfere with the reliability of the deductions that can be drawn from the work that has been done elsewhere.

With regard to the relative importance of the insects that have been included, some of them (e.g., the *mosquito* of coffee, the *cut worms*, *sapper*, and *hispa* of rice, the *borer* of sugarcane, and the *weevil* of wheat) are known to do great damage in India; these are printed in capital letters to distinguish them from the majority of the species which, though they attack crops and are always liable to increase so as to do serious damage, are not actually known to have done so as yet. As information accumulates, many of the insects at present only recorded as occurring on crops will no doubt have to be transferred to the ranks of those which are known to do serious damage, while it will be possible to weed out others to form a third division of such insects as attack crops but are of no economic importance. In the present stage of the investigation the division of the insects, which are known to attack crops in India, into two groups, is all that can profitably be attempted.

The difficulty in identifying insects is very great, for there are at least twenty thousand different kinds of insects in India already described, besides a vast number of minute species which have hitherto been very much neglected by entomologists, though many of them are of great importance economically. Each of these insects passes through several stages of growth, which generally have no more resemblance to each other than the silk worm has to the moth into which it changes. Again, in the great majority of cases, the injury to the crops is done by immature insects. Now, the immature forms of different insects are

often so much like each other that entomologists are sometimes unable to determine precisely what an insect is, unless they are able to examine mature specimens. Mature specimens, however, are often difficult to get, for some insects take years in developing, while others are not easily reared under artificial conditions. Even when the mature form is forthcoming, the determination of the species does not by any means follow as a matter of course, for many insects, when full grown, still have much superficial resemblance to other insects, though in reality they may differ from them in important points. Again, the confusion which has been widely introduced into entomological writings, owing to the indiscriminate manner in which new species have again and again been described on evidence obtained solely by examining limited collections of dried specimens, has added what is at present perhaps the greatest stumbling-block in the way of arriving at the correct identification of Indian insects. It is generally impossible therefore to identify a species with certainty from a description, unless the description is a very minute one, and even then mistakes are always liable to occur, unless comparison can be made with authentically identified specimens. A treatise, therefore, of some length would be required to give sufficient descriptions to make it possible even to attempt the identification of all the insects that are noticed in this paper; and as the principal object in the present instance is to give a list of the species which affect crops, it has been thought best merely to notice roughly what a few of the more important of them look like superficially, disregarding the fact that the same remarks would very often apply equally to other insects with different habits.

Much reliance cannot be placed in the accuracy of the Native names

The extent to which the Native names are reliable. that are quoted; for, although some names appear to be used with great constancy for denoting particular insects (as, for example, *gandhi* for the rice sapper—*Leptocorisa acuta* of Bengal), in many instances they seem to be used loosely and to have little more significance than such popular English terms as *caterpillar*, *weevil*, *grub*, and *locust*, all of which cover a multitude of distinct species—many of them with very different habits. Besides the inaccuracy due to the indefinite significance of many of the names themselves, great carelessness has also been noticed in the naming of some of the specimens that have been sent to the Museum, as, for instance, where some butterfly caterpillars and red Hemiptera were sent in one bottle under a single Native name, though it is scarcely credible that any one could have supposed that such different creatures were forms of one and the same animal. Again, what is apparently one name often appears under several forms (e.g., *pamari*, *paruli*, and *parali*, all



for the rice *Hispa*). The disentanglement of this subject requires more local knowledge than is possessed by the writer, and in the following paper therefore he has contented himself with quoting the native names that have been furnished to him, merely omitting the ones that are obviously misleading.

COLEOPTERA = BEETLES.

*Cicindelidæ* = Tiger beetles.

1. *Cicindela sexpunctata* Fabr.—An active beetle, which devours other insects. Reported from Chumparun as very effectual in destroying the Rice sapper (*Leptocorisa acuta*).

*Carabidæ* = Ground beetles.

2. *Calosoma orientale* Hope.—An active black beetle, about the size of a small cockroach: it feeds on other insects, and has been reported as very useful in the Punjab in destroying young locusts of the species *Acridium peregrinum*.

*Trogositidæ*.

3. *Trogosita mauritanica* Linn.—A small brown beetle, which in its grub stage does some injury to stored wheat (*Triticum sativum*) in Bengal, but which in its beetle stage is said to feed upon the Tineid moths, which are also destructive in granaries.

*Cucujidæ*.

4. *Silvanus surinamensis* Linn.—A tiny little brown beetle, with white active grubs, which is a common warehouse pest in India. It has been reported as destructive to ships' biscuit in Calcutta and to cholum (*Sorghum vulgare*) seed in Madras. It has also been found in date (*Phoenix dactylifera*) fruit in the Calcutta bazar.

*Dermestidæ*.

5. *Dermestes vulpinus* Fabr.—A little dark coloured beetle, with white hairy grubs, which is a common warehouse pest. It has been reported as destructive to stored silk cocoons in Rajshahye, also as destructive to badly preserved skins.

6. *Æthriostoma undulata* Motsch.—(*Trogoderma* sp., of the British Museum)—A little brown beetle, with white hairy grubs, known as *Kapra* in the Delhi bazaar, where it is said sometimes to destroy as much as six or seven per cent. of wheat (*Triticum sativum*) stored in godowns.

*Lucanidæ* = Stag beetles.

7. *Lucanus lunifer* Hope.—A big dark-green coloured beetle, the male with enormously developed jaws. It is thought to be the species reported as very destructive in Naini Tal to oak trees (? *Quercus* sp.) into the wood of which the grubs tunnel (*Thompson*).



*Melolonthini* = *Cockchafers* or *White grubs*.

8. *LACHNOSTERNA IMPRESSA* Burm.—A thick-set brown beetle, with curved white fleshy grubs, which were reported as very destructive in gardens in Darjeeling in the year 1883. The insect did a great deal of damage to young tea (*Camellia theifera*) plants in the same district in October 1891.

9. *Lachnosterna pinguis* Walker.—Said to be one of the insects known as *white grub*, which have proved very destructive to coffee (*Coffea arabica*) bushes in Ceylon. The insect is chiefly known by the curved white fleshy grubs which are found in the ground about the roots of the coffee bushes on which they feed.

10. *Ancyronycha* sp.—Another of the insects known as *white grub* in Ceylon coffee (*Coffea arabica*) estates (Nietner).

11. *Undetermined cockchafer larvæ* were reported as very destructive to paddy (*Oryza sativa*) and maize (*Zea Mays*) in Chittagong in 1881.

*Dynastini* = *Goliath beetles*.

12. *ORYCTES RHINOCEROS* Linn.—A large black or brown beetle, with a protuberance like the miniature horn of a rhinoceros on the upper part of its head. It has been reported as very injurious to palm trees, especially cocoanut (*Cocos nucifera*) palms in Madras and Singapore; it has also been noticed in Calcutta. The Cinghalese name for it is said to be *Gascooroominga*. It damages palm trees by cutting large holes through the young leaf shoots.

*Buprestidæ*.

13. *Chrysobothris sex-notata* Gory.—Thought to be the insect reported by Mr. Thompson as boring into sâl (*Shorea robusta*) wood after it is felled, sometimes rendering the timber unfit for use.

14. *Psiloptera fastuosa* Fabr.—Said to attack teak (*Tectona grandis*) trees in Malabar.

15. *Belionota scutellaris* Fabr.—Thought to be the insect reported by Mr. Thompson as boring into the wood of the *khair* tree (*Acacia Catechu*).

16. *Sphenoptera gossypii* Kerremans.—A small species, which has been reported to injure cotton (*Gossypium herbaceum*) plants in Nagpur, the larvæ tunneling into the stems.

17. *Undetermined Buprestidæ*.—A large species, said to tunnel into mango (*Mangifera indica*) trees (Thompson); also a small species said to attack *chir* (*Pinus longifolia*), sometimes rendering the wood unfit for beams (Thompson); and a species which has been sent to the Museum as boring into poplar (? *Populus euphratica*) trees in Baluchistan. (N.B.—In the case of the Buprestidæ the injury is done by the immature insect which tunnels into timber. The larvæ are flattened legless grubs, with the front portion of the body expanded laterally).

*Plinidæ.*

18. *Gibbium scotias* Fabr.—A tiny brown beetle, reported from Behar as injuring the outer portion of opium (*Papaver somniferum*) cakes by tunneling into them.

19. *LASIODERMA TESTACEUM* Duft. (the Cheroot weevil).—A little brown beetle with white grubs. It is said to seriously interfere with the trade in Indian tobacco (*Nicotiana Tabacum*). It has also been noticed as attacking stored rice (*Oryza sativa*), saffron (*Crocus sativus*), and the leaf coverings of opium (*Papaver somniferum*) cakes. The larvæ tunnel through and through the substances they attack, making holes the biggest of which are about a sixteenth of an inch in diameter.

20. *Rhizophorthera pusilla* Fabr.—A little brown beetle, which is a common warehouse pest. It has been reported in India as attacking stored wheat (*Triticum sativum*), cholom (*Sorghum vulgare*) seed, and ships' biscuits.

21. *DINODERUS* SP. (the Bamboo insect).—A small brown beetle with white grubs. It is very destructive to bamboos (*Bambusa* sp.) in all parts of India. It is said to be known in the North-Western Provinces as *ghoon* and in Mysore as *cootee*. The minute holes with which bamboos are so often studded are the work of this insect.

22. *Cænophrada anobioides* Waterh. *Bostrychus* sp. and *Sinoxylon* sp. Small black beetles, all of which have been reported as tunneling into guava (*Psidium Guava*) trees in Hazaribagh.

*Tenebrionidæ.*

23. *Opatrum depressum* Fabr.—A little flat beetle, which has been reported as attacking linseed (*Linum usitatissimum*) and wheat (*Triticum sativum*) plants.

24. *Tribolium ferrugineum* Fabr.—A tiny little, brown beetle, which is a common warehouse pest in India. It has been reported as damaging ships' biscuit in Calcutta.

25. *Obscure Tenebrionid larvæ* have been reported from Mysore as damaging sandalwood (*Santalum album*) trees by boring into the stems.

*Cantharidæ = Blister beetles.*

26. *Epicauta rousi* Cast, also *E. tenuicollis* Pall. Said to attack cholom (*Sorghum vulgare*) plants in Madras.

*Curculionidæ = Weevils.*

27. *CALANDRA ORYZÆ* Linn. (the Wheat and Rice Weevil of India).—Very destructive to stored wheat (*Triticum sativum*), rice (*Oryza sativa*), and cholom (*Sorghum vulgare*) seed. Known in the Delhi bazar as *sulsi*.

The loss occasioned by this insect to wheat exported from India has been estimated at as much as  $2\frac{1}{2}$  per cent. The insect itself is a tiny brown beetle, with long snout and elbowed antennæ. Its young are little white legless grubs, which inhabit the grains.

28. *Rhynchophorus ferrugineus* Oliv.—The larvæ of this large weevil are white fleshy legless grubs; they tunnel into the trunks of date (*Phoenix dactylifera*), cocoanut (*Cocos nucifera*) and other palms in India, and kill a large number of trees.

29. *Cyrtotrachelus dux* Bohem.—A large brown weevil, the male with enormously developed fore legs, has been reported as destroying the young succulent asparagus-like shoot of the hill bamboo (*Dendrocalamus Hamiltonii* in Sikkim).

30. *Calandra* sp.—Said to damage stored opium (*Papaver somniferum*) seed (Scott).

31. *Cryptorhynchus mangiferae* Fabr.—A small earth-coloured weevil, with white legless grubs. It is said to be very destructive to mango (*Mangifera indica*) fruit in Bengal and Sylhet.

32. *Astycus lateralis* Fabr.—A small greenish weevil, reported in the beetle stage as defoliating mulberry (*Morus*) bushes in Rangoon. Also thought to be the species which has been reported by Mr. Thompson as tunneling into the timber of *chir* (*Pinus longifolia*) in the North-Western Provinces; in this case the injury is no doubt done by the larvæ.

33. *Sipalus granulatus* Fabr.—Thought to be the species which has been reported by Mr. Thompson as tunneling into Dhak (*Butea frondosa*) in the North-West Provinces.

34. *Desmidophorus hebes* Fabr.—Reported as attacking Hibiscus plants in Durbhanga.

35. *Sitones* sp.—A small weevil, thought to belong to this genus, has been reported as destructive to opium (*Papaver somniferum*) seedlings in Ghazipur.

36. *Archives destructor* Nietner.—Said to attack the leaves of coffee (*Coffea arabica*) bushes in Ceylon, occasionally doing considerable injury (Nietner).

37. *Cylas turcipennis* Nietner.—Said to be destructive to sweet potatoes (*Ipomœa Batatas*) in Ceylon (Nietner).

38. *Sphærophorus planipennis* Nietner.—Said to injure cocoanut (*Cocos nucifera*) trees in Ceylon (Nietner).

39. *Apion strobilanthes* Desbroch.—Reported as destructive to the seed of the herbaceous weed (*Strobilanthes pectinatus*) in Sikkim.

40. *Undetermined Curculionidæ larvæ* have been reported as very destructive to young mahogany (*Swietenia Mahagoni*) trees in the Western Doors. They were found tunneling beneath the bark.

41. *A minute undetermined weevil*, said to have been excessively destructive to the seed of sâl (*Shorea robusta*) trees in the North-Western Provinces in the year 1863 (Thompson).

42. *A small undetermined weevil*, reported as destroying 90 per cent. of the seed of the forest tree (*Quercus pachyphylla*) in Darjeeling.

#### *Scolytidæ.*

43. *Trypodendron domesticum* Linn., also *T. signatum* Fabr.—Minute brown beetles, which are said to attack the casks in which beer is shipped to India.

44. *Xyleborus perforans* Wollast. (= *X. saweseni* Dist.).—A little brown beetle, considerably bigger than the preceding. It is thought to be the species which so often drills small holes into the staves of casks in which beer is shipped to India. It is also said to have proved very destructive to sugarcane (*Saccharum officinarum*) in the West Indies, and is likely to prove troublesome in a similar manner in India.

45. *Diaprus impressus* Janson.—A minute brown beetle, reported as tunneling into oak stumps (*Quercus* sp.) in the North-West Himalayas.

46. *Polygraphus* sp. (allied to *P. pubescens* of Europe).—A minute brown beetle, reported as tunneling into the bark of *Pinus excelsa* trees. It is not thought to do any very serious injury.

47. *Pityogenes scitus* Bland.—A minute brown beetle, which tunnels into the shoots of conifers. Little is known about it.

48. *Platydictylus scaspinosus* Motsch.—A small brown beetle, reported as destructive to paddy (*Oryza sativa*) in Burma. The injury is due to its tunneling into the stalks.

49. *Undetermined species of Scolytidæ*, perhaps identical with some of the above, have been noticed as very destructive in India to the oak (*Quercus incana*); also to immature sâl (*Shorea robusta*) and *chir* (*Pinus longifolia*) timber. Like the bamboo borer (which, however, belongs to a different group of beetles), these insects are known in the North-West Provinces as *ghoon* (Thompson).

#### *Bruchidæ.*

50. *BRUCHUS CHINENSIS* Linn.—The small brown gram weevil of Calcutta. It is very destructive to stored pulses (*Cajanus indicus*, etc.). It is said to be known in Nuddea as *Ghora poka*, and in Ganjam as *Pesala puruga*. The larvæ are little white grubs which inhabit the pulse seeds.

51. *Bruchus emarginatus* Allard. var.—The large grey pea weevil of the Calcutta bazar. It attacks stored peas (*Pisum sativum*, etc.) exactly as the gram weevil attacks pulses.

52. *Caryoborus gonagra* Fabr.—A small brown beetle about the size of a pea. Its larvæ, which are little white legless grubs, do some damage to the tamarind (*Tamarindus indica*) in Calcutta, by tunneling into the seed.

53. *Bruchus* sp.—Said to damage stored poppy (*Papaver somniferum*) seed (Scott).

*Cerambycidæ = Longicornes.*

54. *XYLOTRECHUS QUADRUPES* Chev. — *The coffee-borer* of Southern India and the *white* or *Indian borer* of Ceylon coffee planters. This is a slender beetle about three quarters of an inch in length; it proved exceedingly destructive to coffee (*Coffea arabica*) in Southern India about the year 1867. As in the case of other Cerambycidæ the larva is a white fleshy legless grub, with powerful jaws and hardened cuticle suitable for its life in the wood of the coffee stem. The damage is due to the holes which the grubs bore into the stems of the coffee bushes.

55. *Celosterna scabrata* Fabr.—*The sâl girder*. Reported as damaging sâl (*Shorea robusta*) trees in Oudh. A large thick-set beetle with long antennæ. It damages the tree by ringing the shoots in order to render them suitable for the reception of its eggs.

56. *Plocoderus obesus* Gahan. (= *P. pedestris* Cotes). Reported as tunneling into sâl (*Shorea robusta*), jingham (*Odina Wodier*), and into dhak (*Butea frondosa*). It is a brown beetle, about an inch and a half in length, with long antennæ. When full grown, its larva shelters itself in a curious egg-like case which is to be found in the burrow in the timber.

57. *Neocerambyx holosericeus* Fabr. (= *Cerambyx vatica* Thompson). —Reported as attacking sâl (*Shorea robusta*) and sâj (*Terminalia tomentosa*) in the North-West Provinces, also teak (*Tectona grandis*) in Kulsi, Assam. It is a large beetle, covered with golden pubescence.

58. *Stromatium barbatum* Fabr.—Noticed as attacking the sapwood of dry khair (*Acacia Catechu*) wood in the Dehra Forest School Museum, also packing-cases made of dealwood (*Pinus* sp.) in Calcutta, and growing teak trees (*Tectona grandis*) in the Kulsi plantation.

59. *Batocera rubus* Short. = *Curuminga* of the Cinghalese.—A large beetle said to tunnel into cocoanut (*Cocos nucifera*) trees (Short).

60. *Batocera* sp. Said to bore into the wood of the wild willow tree (*Salix tetrasperma*) (Thompson).

61. *Monoharus soongna* Thompson (= *Batocera* sp.).—Said to attack a number of trees, including the *seemul* (*Bombax malabaricum*), the *soangna* (*Moringa pterygosperma*), and the *roongra* (*Erythrina suberosa*), much injury being often done by it (Thompson).

62. *Stromatium asperulum* White, and *Ægosoma lacertosum* Pascoe.—Both reported as tunneling into teak (*Tectona grandis*) in the Kulsi plantation.

*Chrysomelidæ.*

63. *HISPA ÆNESCENS* Baly (the rice Hispa of Bengal).—Very destructive to young paddy (*Oryza sativa*) plants. A small beetle, dark green in colour, covered with minute prickles. Like other Chrysomelidæ, it injures the plant by feeding on the leaves. The Native names of the insect, as reported from Lower Bengal, are *paruli*, *pavali poka*, *pamari*, *sanki*, *shankipoka*, and *sankapoka*; while in Chittagong it is said to be known as *Burma chaudali*, and in Durbhunga as *kal* or *mudhwa*.

64. *Diapromorpha melanopus* Lacord. (known as the Orange beetle).—A small yellow beetle, reported as attacking tea (*Camellia theifera*) shoots in Sibsagar, Assam.

65. *Aulacophora abdominalis* Fabr. A small yellow beetle, reported from Saharanpore as attacking *Cucurbitaceæ* of all kinds; from elsewhere in the North-West Provinces it has been reported as attacking water caltrop (*Trapa bispinosa*); from Ganjam it has been reported as attacking cotton (*Gossypium herbaceum*), gram (*Cicer arietinum*), and cucumber (*Cucumis sativus*); from Nuddea it has been reported as "injurious to plants and vegetables;" while from Hooghly it has been reported as attacking paddy (*Oryza sativa*).

66. *Aspidomorpha militaris* Fabr.—A little golden-coloured shield-shaped beetle, with black markings. Reported as defoliating *Convolvulaceæ*.

67. *Halitica nigro-fusca* Pearson.—Said to attack the leaves of garden vegetables in the Himalayas, also indigo (*Indigofera tinctoria*) in Rungpore (Pearson).

68. *Chætocnemis basalis* Baly.—Said to attack paddy (*Oryza sativa*) seedlings in Burma (Shipley).

*Coccinellidæ* = *Lady-bird beetles.*

69. *Chilocorus circumdatus* Schonh.—A little beetle, said to prey upon the brown bug (*Lecanium coffeæ*) of coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

70. *Scymnus rotundatus* Motsch.—Said to prey on the white bug (*Pseudococcus adonidum*) of coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

71. *Epilachna viginti-octo-punctata* Fabr.—This insect (contrary to the usual habits of the members of the family) has been found defoliating pumpkin (*Cucurbitaceæ*) in Dehra. It is also reported as destroying whole fields of brinjal (*Solanum Melongena*) plants in Burdwan, and as attacking this plant in Balasore.

## HYMENOPTERA.

## Formicidæ.

72. *Solenopsis gemminata* Fabr.—An ant, thought to belong to this species, reported as injuring potato (*Solanum tuberosum*) tubers in Thayetmyo, Burma.

## Ichneumonidæ.

73. *Pimpla punctator* Linn.—A yellow and black wasp-like insect with long body. It is parasitic upon the caterpillars of a number of wild silk moths.

74. *Pteromalus oryzæ* Cameron.—A minute coppery-green coloured insect, believed to be parasitic upon the wheat and rice weevil (*Calandra oryzæ*).

## Chalcididæ.

75. *Chalcis* (*Brachymeria*) *euplæa* Westw.—Parasitic on the Dooars tea and sâl caterpillar (*Dasychira thwaitesii*). It is a little four-winged insect, about the size of a house fly.

76. *Chalcis criculæ* Kohl.—Said to be parasitic on wild Cricula silk-worms in Ranchi.

77. *COTESIA FLAVIPES* Cameron.—A minute fly-like insect, which is parasitic upon the sorghum-borer (? *Diatræa saccharalis*). It has been noticed as very effectual in keeping this destructive borer in check.

78. *Aphelinus theæ* Cameron.—A minute fly-like insect, said to attack the tea scale bug (*Chionaspis theæ* Maskell).

79. *Cirrhopilus coccivorus* Motsch. MS.—Said to be parasitic on the brown bug (*Lecanium coffeæ*) which attacks coffee (*Coffea arabica*) in Ceylon Nietner).

80. *Encyrtus nietneri* Motsch.—A minute yellowish fly-like insect, said to be parasitic both on the brown bug (*Lecanium coffeæ*) and also on the white bug (*Pseudococcus adonidum*) which attack coffee (*Coffea arabica*) in Ceylon (Nietner).

81. *Encyrtus paradiscus* Motsch. MS.—Said to be parasitic on the brown bug (*Lecanium coffeæ*) of Ceylon (Nietner).

82. *Scutellista cyanea* Motsch.—Said to be parasitic on the brown bug (*Lecanium coffeæ*) of coffee (*Coffea arabica*) in Ceylon (Nietner).

83. *Marietta leopardina* Nietner.—Said to be parasitic on the brown bug (*Lecanium coffeæ*) in Ceylon. (Nietner).

84. *Chartocerus musciformis* Motsch.—Said to attack the white bug (*Pseudococcus adonidum*) of coffee (*Coffea arabica*) in Ceylon (Nietner).

85. *Cephaleta purpureiventris*, Motsch., *C. brunneiventris* Motsch., also *C. fusciventris* Motsch. MS.—Said to be parasitic on the brown bug (*Lecanium coffeæ*) of coffee (*Coffea arabica*) in Ceylon (Nietner).



*Proctotrupidæ.*

86. *Platygaster oryza* Cameron.—A minute fly-like four-winged insect which attacks the rice fly (*Cecidomyia oryza* W. Mason).

## RHOPALOCERA = BUTTERFLIES.

*Lycanidæ* = Blues and coppers.

87. *Virachola isocrates* Fabr.—The caterpillar of this graceful purplish butterfly bores into loquat (*Eryobotrya japonica*), guava (*Psidium Guava*), and pomegranate (*Punica Granatum*) fruit, but does not often occasion any very extensive injury (De Niceville).

88. *Lampides elpis* Godart.—The caterpillar of this butterfly has been reported to tunnel into cardamom (*Elettaria Cardamomum*) seeds in Ceylon, where it is said to do a considerable amount of injury.

*Pierinæ* = White butterflies.

89. *Mancipium nepalensis* Grey.—The caterpillar of this butterfly has been reported as attacking gram (*Cicer arietinum*), linseed (*Linum usitatissimum*), sugarcane (*Saccharum officinarum*), and other plants in Umballa.

*Papilionidæ* = Swallow-tailed butterflies.

90. *Papilio erithonius* Cramer (also allied species).—The caterpillars of these large butterflies have been reported as doing a considerable amount of damage by defoliating young oranges (*Citrus Aurantium*) and lemon (*Citrus medica*) trees in different parts of India.

*Hesperidæ* = Skippers.

91. *Gangara thyrsis* Fabr.—The caterpillar of this butterfly has been reported as destructive to the leaves of cocoanut palms (*Cocos nucifera*) in Malabar.

92. *Suastus gremius* Fabr.—The caterpillar of this butterfly has been reported as attacking paddy (*Oryza sativa*) in Bangalore, where it is said to be known locally as *Pattanai*. (Information somewhat doubtful.)

## HETEROCERA = MOTHS.

*Ægeriidæ, Cossidæ, Hepialidæ and Allies.*

(Caterpillars all wood-borers.)

93. *SPHECIA OMMATIE-FORMIS* Moore (*Ægeriidæ*).—The caterpillar of this moth is said to do considerable damage to poplar (? *Populus euphratica*) trees in Baluchistan by tunneling into the stem close to the ground. The moth is a brightly coloured insect, which looks superficially almost exactly like a big yellow and brown wasp.

94. *ZEUZERA COFFEE* Nietner (Cossidæ).—Known as the *red borer* of coffee (*Coffea arabica*) bushes in Southern India. The caterpillar tunnels into coffee stems and has been reported to do considerable damage on coffee estates. It has also been reported as tunneling into the stems of tea (*Camellia theifera*) bushes in Ceylon and Cachar, and into the stems of young sandalwood (*Santalum album*) trees in Mysore. The moth is a fluffy white insect, speckled with dark greenish spots. The caterpillars are reddish grubs.

95. *Phassus purpureseus* Moore (Hepialidæ). The caterpillar of this moth is said to tunnel into the wood of cinchona (*Cinchona sp.*) in Ceylon (Moore).

96. Undetermined caterpillars belonging to this group of wood-borers have been reported as follows:—(1) a large red caterpillar, probably belonging to the genus *Zeuzera*, reported as very destructive to teak (*Tectona grandis*) trees in Travancore; (2) caterpillars said to attack teak in Nilambur, Malabar; (3) caterpillars said to be very destructive to the charcoal tree (*Sponia orientalis*) in South India (Bidie); (4) caterpillars reported as doing serious damage to orange (*Citrus Aurantium*) and guava (*Psidium Guava*) trees in Lucknow.

*Psychidæ* = *Bag worms*.

(*Caterpillars inhabit cases*.)

97. *Babula grotei* Moore.—The caterpillar of this little moth shelters itself in a cone-shaped case which it carries about upon its back. It defoliates ornamental bushes, such as *Lagerstræmia* and roses (*Rosa sp.*), in Calcutta. It is also thought to be the species which has been reported as attacking the gallnut tree (? *Terminalia Chebula*) in the Madras presidency.

98. *Eumeta crameri* Westw.—The caterpillar of this moth builds a case almost exactly like a miniature faggot of sticks, in the middle of which it lives. It has been reported as defoliating tea (*Camellia theifera*) bushes in Assam, Sikkim, and Ceylon, but does not appear to occasion any very serious injury. It is sometimes known as the *Faggot worm*.

99. *Eumeta sikkima* Moore.—The caterpillar of this moth builds a large rough case out of bits of leaves and stick. It is said to defoliate sâl (*Shorea robusta*) trees in Sikkim, occasionally also attacking tea (*Camellia theifera*) bushes. It does not seem to do much damage.

100. *Govisana bipars*? Walker.—The caterpillar of this moth has been reported as defoliating tea (*Camellia theifera*) bushes in Sikkim; it is said sometimes to kill the bushes by stripping off the bark to form its case.

101. An undetermined *Psychid* has been reported as defoliating tea (*Camellia theifera*) plants in Ranchi.

*Limacodidæ.*

102. *Parasa lepida* Cramer (= *Limacodes graciosa* Nietner).—Known as the “Blue-striped nettle grub” by Ceylon planters; has been reported as defoliating tea (*Camellia theifera*) and coffee (*Coffea arabica*) bushes in Ceylon (Nietner and Green).

103. *Narosa conspersa* Walker.—Said to attack the leaves of coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

104. *Natada velutina* Kollar, or an allied species, reported as defoliating young mango (*Mangifera indica*) trees in Poona.

105. *Parasa* sp.—A slug-like caterpillar, thought to belong to this genus, has been reported as attacking young gram (*Cicer arietinum*) plants in Ganjam. The local name given for the insect was *Aku-telu*.

106. *Undetermined Limacodidæ* have been reported as follows:—(1) caterpillars destructive to paddy (*Oryza sativa*) in the Bhamo district, Burma: (2) caterpillars which defoliated tea (*Camellia theifera*) bushes in the Darrang district, Assam: (3) caterpillars which defoliated young mahogany (*Swietenia Mahagoni*) trees in Bangalore.

*Notodontidæ.*

107. *Stauropus alternus* Walker, or the “Lobster caterpillar,” said to attack the foliage of tea (*Camellia theifera*) and cocoa (*Theobroma Cacao*) plants in Ceylon (Green).

*Arctiidæ, Liparidæ, and Lasiocampidæ.*

[ These are fluffy moths with hair-covered defoliating caterpillars.]

108. *Aloa lactinea* Cramer (*Arctiidæ*).—Reported as a very injurious defoliator in the Sambalpur district, Central Provinces, where it is known as *Palu-pok*. It is also noticed by Mr. Nietner as occasionally attacking the leaves of coffee (*Coffea arabica*) bushes in Ceylon.

109. *Spilosoma suffusa* Walker (*Arctiidæ*).—Caterpillars thought to belong to this species have been reported as attacking til (*Sesamum indicum*) and other crops in Nagpur.

110. *SPILOSOMA* SP. (*Arctiidæ*).—Caterpillars closely allied to the preceding have been received from Maldah, where they are said to be very destructive to jute (*Corchorus* sp.); also from Ganjam, where they are reported as attacking gingelly (*Sesamum indicum*), castor-oil (*Ricinus communis*), and other plants. In Ganjam the local name for the insect is said to be *Gongali purugu*.

111. *DASYCHIRA THWAITESII* Moore (*Liparidæ*).—Reported as doing much damage by defoliating tea (*Camellia theifera*) and sâl (*Shorea robusta*). The sâl trees throughout two hundred square miles of forest in Assam are said to have been defoliated by it in 1878.

112. *Artaxa limbata* Butler (Liparidæ). Reported as defoliating young mango (*Mangifera indica*) plants in Poona.

113. *Olene mendosa* Hübn. (Liparidæ).—Reported as attacking the leaves of tea (*Camellia theifera*) bushes in Darjeeling.

114. *Orgyia ceylanica* Nietner (Liparidæ).—Said to attack tea (*Camellia theifera*) bushes in Ceylon (Nietner).

115. *Euproctis virguncula* Walker (Liparidæ).—Said to attack coffee (*Coffea arabica*) bushes in Ceylon—(Nietner).

116. *Trichia exigua* Feld. MS. (Liparidæ).—Said to attack coffee (*Coffea arabica*) bushes in Ceylon—(Nietner).

117. *Spalyria minor* Moore (Lasiocampidæ).—A hairy caterpillar, reported as attacking numerous plants in Shwebo, Burma, where it is said to be known locally as *Pagaungde* or *Rugaungde*.

118. UNDETERMINED HAIR-COVERED CATERpillars, allied to the preceding, have been reported as follows:—

- (1) a species which is thought to be Liparid, said to have defoliated sâl (*Shorea robusta*) in Kulsî, Assam;
- (2) caterpillars said to have been very destructive to paddy (*Oryza sativa*) in Ranchi;
- (3) caterpillars said to attack *raoî* crops in Monghyr, where they are known as *Bhua*;
- (4) caterpillars said to do much damage to paddy in Burma in the rainy season;
- (5) caterpillars which are thought to be Arctiidæ, said to have attacked tea (*Camellia theifera*) in Jorhat, Assam;
- (6) caterpillars said to attack rape-seed (*Brassica glauca*) in the Umballa district;
- (7) processional caterpillars said to have defoliated oak (*Quercus lamellosa*) trees in Sikkim.

#### NOCTUES.

[These are generally thick-bodied moths with thread-like antennæ. Their larvæ are smooth caterpillars, usually with four pairs of prolegs and one pair of anal claspers.]

119. *ACHÆA MELICERTE* Drury (Ophiuridæ).—A greyish moth, the hind wings dark brown, marked with greyish white. The caterpillars are said to be known as *Janga purugu* in Madras, and as *Nooludaram purugu* in Ganjam. They have been reported as defoliating castor-oil (*Ricinus communis*) plants in Madras, Ceylon, Calcutta, Assam, and Bellary; also as attacking dhal (*Cajanus indicus*) plants in Dehra Dun, and sugarcane (*Saccharum officinarum*), paddy (*Oryza sativa*), and brinjal (*Solanum Melongena*) plants in Ganjam.

120. *HELIOTHIS ARMIGERA* Hübn. (Heliothidæ).—This is a small greyish moth, with dusky brown hind wings. The caterpillar attacks crops in all parts of the world and is most destructive. In India it has been reported as follows:—attacking paddy (*Oryza sativa*) in Backergunj, where it is said to be known as *leda*; attacking paddy in Sambalpur, Central Provinces, where it is said to be known as *harnipok*; attacking paddy in Khulna; attacking the hemp (*Cannabis sativa*) plant in Bengal; attacking khesari (*Lathyrus sativus*) in Patna, where, like other Noctues caterpillars, it is said to be known as *lurkz*; attacking pulse (especially *Dolichos Lablab*) in Bangalore; attacking poppy (*Papaver somniferum*) capsules in Behar, where it has been described under the name of *Mamestra papaverorum* Scott. It is thought to be the species which is said to be known as *kajra* in Monghyr, where it is reported to do great damage by devouring both paddy and rabi crops. It is likely to be the species referred to by Duthie and Fuller as *bahadura*, an insect which they notice as very destructive to gram and pea crops (*Leguminosæ*) in the North-West Provinces. It is also likely to damage the immature bolls of the cotton plant (*Gossypium herbaceum*) in India, for in the United States, where it is known as the boll worm, it does a vast amount of damage in this way to the cotton crop.

121. *Mudaria cornifrons* Moore (Hadenidæ).—The caterpillar of this moth injures the pods of the silk cotton tree (? *Bombax malabaricum*) in Calcutta by tunneling into them.

122. *Polytela gloriosa* Fabr. (Glottulidæ).—A brightly coloured yellow and black caterpillar, which does some damage in gardens, both in Calcutta and in Dehra, by defoliating ornamental plants.

123. *Leucania extranea* Guen. (Leucaniidæ).—Reported as doing much damage in Bengal by biting off young paddy (*Oryza sativa*) plants. It has also been found feeding upon ornamental oat (*Avena sativa*) plants in Calcutta, and is said to attack the pea (*Pisum sativum*) in Patna.

124. *Leucania loreyi* Dup. (Leucaniidæ).—One of the insects known in Sambalpur, Central Provinces, as *harnipok*. It is reported to have destroyed an eighth of the paddy (*Oryza sativa*) crops in some parts of Sambalpur in September 1888.

125. *Laphygma exigua* Hübn. (Apamiidæ).—The caterpillar of this moth has been reported as attacking the lentil plant (*Ervum Lens*).

126. *Prodenia littoralis* Boisd. (Apamiidæ).—The caterpillar of this moth has been reported as attacking mulberry (*Morus*) bushes.

127. *Galleriomorpha lichenoides* Felder MS. (Hypogrammidæ).—Said occasionally to attack coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

128. *AGROTIS SEGETUM* Schiff. (Noctuidæ).—A smooth earth-coloured caterpillar, which does a good deal of damage in coffee estates in Southern India and Ceylon by biting off the young coffee (*Coffea arabica*) plants close to the ground. It is known by coffee-planters as the *ringer*. In India it is believed to be confined to comparatively high elevations, such as the Himalayas and the Nilgiris. It is well known in Europe as a destructive Cut worm to many crops.

129. *AGROTIS SUFFUSA* Fabr. (Noctuidæ).—The caterpillar of this cosmopolitan moth does a great deal of damage in India by biting off young plants of all kinds close to the ground. It has been reported as follows:—(1) attacking young opium (*Papaver somniferum*) plants: in this connection it is said to be known in Ghazipur as *kerouna*, in Fatehgarh as *suree*, and in Behar as *kumwah*; (2) attacking young tea (*Camellia theifera*) plants in Ceylon; (3) attacking potato (*Solanum tuberosum*) plants in Kurseong; (4) attacking such rabi crops as mustard (*Brassica*) and linseed (*Linum usitatissimum*) in Jessore; (5) attacking young plants of wheat (*Triticum sativum*), barley (*Hordeum vulgare*), gram (*cicer arietinum*), oats (*Avena sativa*), and peas (*Pisum sativum*), in Murshidabad and Tipperah; (6) attacking the leguminous plant *Lathyrus sativus* in Patna. When full grown, the caterpillars are smooth earth-coloured grubs, about a couple of inches in length and as thick as lead pencils; they are to be found in holes in the fields they frequent.

130. *Ochropleura flammata* Linn. (Noctuidæ).—The caterpillars of this moth are much like those of *Agrotis suffusa*; they have been reported as attacking opium (*Papaver somniferum*) plants in the same manner.

131. *Plusia nigrisigna*? Walker (Plusiidæ).—Said to attack the gram plant (*Cicer arietinum*) in Patna.

132. *Undetermined Noctues scaterpillars* have been reported as follows:—(1) boring into the seeds of the Tur plant (*Cajanus indicus*) in Nagpur; (2) doing much damage to rabi crops in Orissa, where they are known as *kala mundi*; injurious to crops in Tipperah (Bengal), where they are known as *leda poka*; (4) attacking red gram and country beans (Leguminosæ) in Ganjam, where they are known as *kandula purugu* or *penki purugu*; (5) attacking paddy (*Oryza sativa*) in South Arcot; (6) attacking such rabi crops as mustard (*Brassica*), barley (*Hordeum vulgare*), safflower (*Carthamus tinctorius*), and wheat (*Triticum sativum*) in Budaon; (7) cutting off potato plants in Rajsbahye; (8) defoliating teak (*Tectona grandis*) trees in Midnapore; (9) injuring jute (*Corchorus*) plants in Maldah.

*Geometres.*

[The moths are usually slender-built creatures, with large wings and comb-like antennæ. The caterpillars are long, slender, smooth creatures, which have but few prolegs, and these set very far back; they hump up the middle of the body into a loop in progressing, and are hence called *loopers*.

133. *Epithecia coffearia* Felder MS. (Larentidæ).—Said to attack coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

134. *Boarmia leucostigmata* Felder MS.; also *Boarmia zeylanicaria* Felder MS. (Boarmidæ).—Both said to attack coffee (*Coffea arabica*) bushes in Ceylon.

135. *Obscure Looper caterpillars*, reported as defoliating tea (*Camellia theifera*) bushes in Nowgong, Assam.

*Deltoides.*

136. *Dragana pansalis* Walker (Herminiidæ).—A small moth, said to be injurious to sugarcane (*Saccharum officinarum*); nothing further is known about it.

*Microlepidoptera.*

[Minute moths, with very various habits.]

137. *DIATRACA SACCHARALIS* Cotes (Crambidæ).—The caterpillars of this moth are little white grubs, about an inch in length. They tunnel into sugarcane (*Saccharum officinarum*) and maize stalks (*Zea Mays*), and do a great amount of damage in India. Closely allied or identical insects tunnel into sorghum stalks (*Sorghum vulgare*), not, only destroying much of the crop, but also rendering the plant unwholesome to cattle. The insect is said by Duthie and Fuller to be known by the natives of the North-West Provinces, in the case of sugarcane as *silai*, and in the case of sorghum as *bhaunri*. The sugarcane borer has been reported from Baroda, where it was said to be known as *narkote*; from the Rungpore, Hooghly, and Burdwan districts, where it was said to be known as *dhosah*; from Mymensingh, where it was said to be known as *mandaruah*; from Ganjam, where it was said to be known as *monjikila purugu*; from Sibpore, where it was said to be known as *majera*; and from Cawnpore, where it was said to be known as *reotha*. An allied caterpillar tunnels into the stems of brinjal (*Solanum Melongena*) plants: this insect has been reported from Ganjam, where it is said to be known as *vanga purugu*; also from Berhampore and Ranchi.

138. *Eudiotpes indica* Saunders (Margaronidæ).—Described as attacking the leaves of cotton (*Gossypium herbaceum*) plants in Java. It is likely also to occur in India.



139. *Maruca* sp. (Margaronidæ).—The caterpillar of an undescribed species of moth, reported by Colonel Swinhoe to be allied to this genus, tunnels into the mango (*Mangifera indica*) fruit in Calcutta.

140. *Parponyx oryzalis* Wood-Mason (Hydrocampidæ).—The caterpillar of this species is aquatic in its habits. It has been reported as attacking paddy (*Oryza sativa*) in Burma, where it is known as *Palanbyoo* or *Teindoung-bo* (Wood-Mason).

141. *MAGIRIA ROBUSTA* Moore (Phycitidæ).—The caterpillar of this moth tunnels into the young shoots of toon (*Cedrela Toona*) trees. It has been reported as very injurious to toon trees in Dehra and Ceylon, and is also said to tunnel into young branches of mahogany (*Swietenia Mahagoni*) trees, and into the green seed pods of toon. The caterpillars are little white grubs, which are to be found in the young terminal shoots.

142. *Nephopteryx punicælla* Moore (Phycitidæ).—The caterpillar of this moth tunnels into the pomegranate (*Punica Granatum*) fruit in Baluchistan.

143. *Nephopteryx sagittiferella* Moore (Phycitidæ).—The caterpillar tunnels into pummalo (*Citrus decumana*) and lime (*Citrus medica*) fruit in Perak, where it is reported as doing a good deal of damage.

144. *CHILO ORYZÆLLUS?* Riley (Crambidæ).—The caterpillar of a moth, which is closely related to this destructive American species, has been reported as tunneling into paddy (*Oryza sativa*) stalks in the Thana district, Bombay; also as tunneling into paddy in Backerganj, where it is known locally as *magra*. A very similar caterpillar has been reported as attacking wheat (*Triticum sativum*) in a similar manner in Nagpur and Poona.

145. *Sphenarches caffer* Zeller (Pterophoridæ).—The caterpillar of this minute plume moth tunnels into the pods of the *popat* plant (*Dolichos Lablab*) in Nagpur. It is said to be known as *mekada*.

146. *Pandemis menciaana* Walker (= *Capua menciaana* Durrant = *Cacæcia* sp. Green). A Tortricid said to damage the leaves of tea (*Camellia theifera*) plants in Ceylon (Green).

147. *Tortrix coffearia* Felder MS. (Tortricidæ).—Said to attack coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

148. *Depressaria gossypiella* Saunders (Plutellidæ).—The caterpillar of this moth is said to tunnel into cotton bolls; it has been reported as having been very destructive in Broach (Saunders). It is perhaps the same as the insect referred to by Duthie and Fuller ("Field and Garden Crops") under the native name of *sundi*.

149. *Gracilaria coffeifoliella* Motsch (Plutellidæ).—Said to attack coffee (*Coffea arabica*) bushes in Ceylon, but to do little or no damage to

them. It thus differs from an allied species, *Elachista coffeella* G. M., which is said to be very injurious to coffee (*Coffea arabica*) in the West Indies (Nietner).

150. *Gracilaria theivora* Walsingham (Plutellidæ).—Reported as attacking the tea plant (*Camellia theifera*) in Ceylon (Green).

151. *Gelechia cerealella* Oliv. (Plutellidæ).—The caterpillar of this moth has been reported as destructive to stored maize (*Zea Mays*) in the Himalayas. It is a well known pest in the United States, where it does a good deal of damage by tunneling into stored maize seed.

152. *Setomorpha rutella* Zeller (Tineidæ).—The caterpillar of this moth has proved destructive to bales of country blanketing in Calcutta.

153. *Tinea pellionella* Linn. (Tineidæ).—The caterpillar of this moth is a minute creature that protects itself in a case much like the case made by *Psychidæ* caterpillars. It has been noticed as very destructive to woollen material in Calcutta. It is a well-known pest in Europe and America.

154. UNDETERMINED MICROLEPIDOPTEROUS CATERPILLARS have been reported as follows:—(1) a minute Tineid caterpillar, which attacks stored *dhan* or unhusked rice (*Oryza sativa*) in Calcutta, spinning the grains together into a web: (2) the caterpillars of a small undetermined moth, which has been supposed to be one of the *Pyrales*, reported as very injurious to the leaves and flowers of the mustard crop (*Brassica*) in Assam, where the insect is known as *bhur*: (3) a minute caterpillar, said to attack the lentil plant (*Ervum Lens*): (4) a species of Tineina, said to tunnel into the fruit of *Ficus Roxburghii* in Calcutta (Cunningham).

#### DIPTERA.

155. *Cecidomyia oryza* Wood-Mason (Cecidomyidæ).—A minute two-winged fly, reported as attacking paddy (*Oryza sativa*) in Monghyr.

156. *Syrphus nietneri* Schiner MS.; also *Syrphus splendens* Dolesch (Syrphidæ).—The larvæ of these flies are said to prey on the coffee louse (*Aphis coffeæ*) in Ceylon (Nietner).

157. *TRYCOLYGA BOMBYCIS* Becher (Muscidæ-Tachinæ).—Parasitic on the mulberry and eri silk-worms of Bengal and Assam. It is much like a big house fly, and is most destructive in silk-rearing establishments, where it often destroys a large proportion of the silk-worms. Closely allied forms have been reared from many species of caterpillars in India, and they are believed to be about the most effectual check which exists for preventing the undue multiplication of defoliating caterpillars of all kinds. A very similar insect is parasitic on the locust of North-Western India (*Aceridium peregrinum*).

158. *Masicera grandis* Bigot (Tachinæ).—A large fly, which is

parasitic on the caterpillars of the tusser silk-worm (*Antheræa mylitta*).

159. *Phora cleghorni* Bigot (Muscidæ).—A minute fly, said to destroy the larvæ of the silk-worm Tachinid (*Trycolyga bombycis*), which it attacks much in the way that the Tachinid attacks the silk caterpillar.

160. *ANTHOMYIA PESHAWARENSIS* Bigot (Muscidiæ). Parasitic upon the eggs of the locust *Acridium peregrinum*. It is believed to have a considerable effect in keeping down the numbers of this locust in India. In appearance it is not unlike a very small house fly.

161. *Oscinis theæ* Bigot (Muscidæ). The grubs of this minute fly are said to tunnel into the leaves of tea (*Camellia theifera*) bushes in Ceylon. They are not thought to do any appreciable damage.

162. *Drosophila apicata* Bigot (Muscidæ).—The grubs of this minute fly are said to attack the fruit of the grape vine (*Vitis vinifera*) in Bashabr.

163. *Anthomyza coffeæ* Nietner (= *A. coffeifolia* Motsch).—The grubs of this fly are said to mine the leaves of coffee (*Coffea arabica*) bushes in Ceylon, where however they are not very common (Nietner). The insect is one of the Muscidæ.

164. *Dacus ferrugineus* Fabr. (Muscidæ).—The grubs of this fly have been reported as doing considerable damage to mangoes (*Mangifera indica*) in Mozufferpore. When full grown, they are about the size of grains of boiled rice, and are to be found in the pulp of the fruit attacked by them.

165. *Rinellia persicæ* Bigot (Muscidæ).—The grubs of this fly have been reported as seriously interfering with the growth of peach (*Prunus persica*) fruit in Chota Nagpur.

166. *Carpomyia paretalina* Bigot (Muscidæ).—This fly has been reported as most injurious to melon (*Cucurbitaceæ*) cultivation in Baluchistan. Larvæ also, which may perhaps belong to the same species, have been reported as destructive to gourds (*Cucurbitaceæ*) in Berhampore. The grubs bore into the fruit and cause it to rot.

#### RHYNCHOTA.

167. *Canthecona furcellata* Wolff. (Pentatomidæ).—A small active yellowish insect, reported to destroy tusser silk-worms (*Antheræa mylitta*), and likely also to help in keeping down the numbers of defoliating caterpillars. It is armed with a proboscis with which it transfixes its victims and sucks up their blood.

168. *Apinis concinna* Dallas (Pentatomidæ).—Reported as attacking rabi crops in the North-West Provinces.

169. *Stachia geometrica* Motsch. MS.—Said to attack young coffee (*Coffea arabica*) berries in Ceylon (Nietner).

170. *LEPTOCORISA ACUTA* Thunb. (Coreidæ).—The rice sapper :—A yellowish insect, about the size of a small wasp. It is most destructive to paddy (*Oryza sativa*). It sucks out the juices of the unripe grain and seriously interferes with the yield of the crop. As much as three quarters of the yield have been reported as sometimes destroyed by it. In parts of Bengal, the North-West Provinces, and Assam, it is said to be known as *gandhi*; in Tinnevely it has been reported as *munju-vandu*; in Bankura as *bhoma*; in Sylhet as *mohua*; while in Ceylon the Cinghalese name is said to be *gayanmessz*, and the Tamil name *vandu*.

171. *DYSDERCUS CINGULATUS* Fabr. (Lygæidæ).—A conspicuous red-coloured insect, about the size of a wasp. It is said to be known as *jhanga* in Cawnpore. It has been reported as attacking cotton (*Gossypium herbaceum*) in Seringapatam, bottle gourds (*Lagenaria vulgaris*) in Cawnpore, and musk mallow (*Hibiscus Abel moschus*) and cabbages (*Brassica oleracea*) in Cossipore. It is closely allied to the species *Dysdercus suturellus*, which is well known as a cotton pest in the United States.

172. *Oxycaenus ingubris* Motsch. (Lygæidæ).—This small black fly-like insect has been reported as attacking cotton (*Gossypium herbaceum*) plants in Seringapatam and Ceylon. It is not unlike the destructive Clinch bug (*Blissus leucopterus*) of America.

173. *Lohita grandis* Grey (Lygæidæ).—Reported to attack cotton (*Gossypium herbaceum*) plants. It is said to be known as *kapasi-poka* in Chudanga, Nuddea (Atkinson).

174. *Physopelta schlaubuschii* Fabr. (Lygæidæ).—Said to be known as *kuti poka* in Kushta (Nuddea). Reported as attacking rice (*Oryza sativa*) plants (Atkinson).

175. *HELOPELTIS THEIOVORA* Moore (Capsidæ).—Superficially very much like a mosquito, and hence generally known as the *mosquito blight*. It does a great deal of damage to tea (*Camellia theifera*) bushes in India. It chiefly attacks the tender shoots, which are the ones used in making tea; and as it affects wide areas, it is a very formidable enemy of the tea trade. In Ceylon the *mosquito blight*, which attacks tea, has been referred to as *Helopeltis antonii* Signoret, a species which has also been recorded as a formidable enemy to cacao (*Theobroma Cacao*) in that island; while in Sikkim a closely allied or identical species, which attacks cinchona, has been recorded under the name of *Helopeltis febriculosa* Bergroth. The three forms will probably prove to be identical.

176. *Disphinctus humeralis* Walker (Capsidæ). A small insect, said to attack cinchona in Sikkim. It is not thought to be of any importance.

177. *Plata conspersa*, Walker (Fulgoridæ).—A small insect, reported as attacking tea (*Camellia theifera*) in the Mungledye district, Assam. It is not thought likely to be of any importance.

178. *CHLORITA FLAVESCENS* Fabr. (Jassidæ).—A small green insect, about the size of a house fly, which is known in Assam as the *blister blight* and in Sikkim as the *green fly blight*. It attacks tea (*Camellia theifera*) bushes and damages the vitality of the leaves by sucking up their juices. It is said in some cases to do considerable damage.

179. *Idiocerus niveosparsus* Lethierry (Jassidæ).—A small green insect, much like the *green fly blight* of tea. It attacks the flowers of mango (*Mangifera indica*) trees, and is said to damage them to a serious extent. The closely allied species *I. clypealis* Leth. and *I. atkinsonii* Leth. have also been reported in the same connection.

180. *SCHIZONEURA LANIGERA* Hausmann (Aphidæ).—A minute insect, known as *American blight*, which has been reported as exceedingly destructive to apple (*Pyrus Malus*) trees in the Nilgiris and North-West Himalayas. The pest is a cosmopolitan one. It may be easily recognised by the peculiar knotty tumours which it raises on the branches and roots of the trees attacked by it.

181. *Lachnus fuliginosus* Buckton (Aphidæ).—A minute insect, which has been reported as doing considerable damage to apricot (*Prunus armeniaca*), almond (*Prunus communis*), and peach (*Prunus persica*) trees in Baluchistan. It is found on the branches, which it is said to wound to such an extent as to cause them to bleed profusely.

182. *Aphis coffeæ* Nietner (Aphidæ).—A minute insect, known as the *Coffee louse*, which is said to attack coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

183. *Ceylonia theacola* Buckton (Aphidæ).—A minute insect, known as the *Tea aphid*, which is reported as attacking young tea (*Camellia theifera*) plants in Ceylon (Green).

184. *Pemphigus cinchonæ* Buckton (Aphidæ).—A minute insect, found feeding on cinchona (*Cinchona* sp.) in Sikkim, but not noticed to do much damage.

185. *Cerataphis* sp. (Aphidæ).—A minute insect, said to attack cinchona (*cinchona* sp.), in Sikkim, not hitherto noticed as doing any particular damage.

186. *Aphis brassicæ* Linn. or an allied species (Aphidæ).—Is a minute insect, which has been reported as doing much mischief to the mustard (*Brassica*) crops in Hooghly. It is likely to be the same as the Aphid which has been reported as attacking the mustard crop in Assam, where it is known by the Assamese as *mowa* or *mewa*.

187. *Psylla isitis* Buckton (Psyllidæ).—A minute insect, which forms galls on indigo (*Indigofera tinctoria*) plants. It was reported in 1890 as excessively destructive to indigo in Bengal.

188. *Psylla cistellata* Buckton (Psyllidæ).—A small black fly-like insect, reported as attacking the young shoots of mango (*Mangifera*

*indica*) trees in Dehra. It causes the abortion of the young shoots.

189. *Lecanium acuminatum* Sign. (Coccidæ).—A minute scale-like insect, which has been reported as attacking mango (*Mangifera indica*) trees in Ceylon.

190. *Lecanium coffeæ* Nietner (Coccidæ).—A minute scale-like insect known as the *scaly bug* and said to attack coffee (*Coffea arabica*) and tea (*Camellia theifera*) in Ceylon.

191. *Lecanium nigrum* Nietner (Coccidæ).—Known as the *black bug*, and reported as occasionally found upon coffee (*Coffea arabica*) in Ceylon. Also as attacking the croton oil plant (*Croton Tiglium*) and ceara rubber (*Manihot Glaziovii*).

192. *LECANIUM VIRIDE* Green (Coccidæ).—A minutes cale-like insect, known as the *Green scale bug*. It is reported to have proved very destructive to coffee (*Coffea arabica*) bushes in South India and Ceylon. It is also said to be found upon cinchona (*Cinchona sp.*), lime (*Citrus medica*), orange (*Citrus Aurantium*), and guava (*Psidium Guava*) plants, and occasionally on tea (*Camellia theifera*).

193. *Pseudococcus adonidum* Linn. (Coccidæ).—Known as the *white or mealy bug*, said to attack coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

194. *Aspidiotus flavescens* Green (Coccidæ).—Known as the *yellow bark louse*, reported as attacking young tea (*Camellia theifera*) plants in Ceylon (Green).

195. *Eriochiton cajani* Maskell (Coccidæ).—A scale insect, which has been reported as attacking the *Cajanus indicus* plant in Madras.

196. *Chionaspis theæ* Maskell (Coccidæ).—A minute white scale insect, which has been reported as attacking tea (*Camellia theifera*) plants both in the Kangra valley and in Ceylon (= *Aspidiotus theæ* Green).

197. *Chionaspis aspidistræ* Signoret (Coccidæ).—Reported as doing considerable injury to *suparee* palms (*Areca Catechu*) in the Konkan.

198. *ASPIDIOTUS DESTRUCTOR* Signoret (Coccidæ).—A minute insect, which to the naked eye looks like a mealy scurf on the leaves. It has been reported as extremely destructive to cocoanut (*Cocos nucifera*) palms, both in the Laccadive islands and in the Isle de la Réunion. It sucks up the juice of the leaves to such an extent as to sap the vitality of the trees and to destroy great numbers of them.

199. *Aspidiotus theæ* Maskell (Coccidæ).—Reported as attacking tea (*Camellia theifera*) plants both in the Kangra valley and in Ceylon.

200. *Aspidiotus transparens* Green. (Coccidæ).—Said occasionally to attack tea (*Camellia theifera*) plants in Ceylon, where it has been designated the *transparent scaled bark louse* (Green).

201. *Dactylopius adonidum* Linn. (Coccidæ).—Said to attack coffee (*Coffea arabica*), also a species of *Cedrela*, several species of *Ficus*, and other trees in Mysore.

202. *Dactylopius cocotis* Maskell (Coccidæ).—A minute insect, with white cottony secretion. It attacks the leaves of cocoanut (*Cocos nucifera*) trees in the Laccadive islands, but is not thought to do much damage.

203. *Pseudo-pulvinaria sikkimensis* Atkinson.—Said to attack cinchona (*Chinchona* sp.) in Sikkim, but not thought to do any serious damage.

#### ORTHOPTERA.

##### *Acrididæ.*

204. *ACRIDIUM PEREGRINUM* Oliv. (the locust of North-West India).—Periodically invades the fertile plains of India from its home in the sandy plains of Rajputana, Sind, and the Punjab. It is also prevalent throughout the whole of South-Eastern Asia and Northern Africa. The full-grown insect is a big thick-set grasshopper, with short antennæ. When it first acquires its wings it is salmon pink in colour, but as it gets older it becomes at first yellowish and afterwards dull purple in tint. It forms vast flights, which are sometimes thick enough to hide the sun from sight as they pass in the air. The young are little black and yellow wingless grasshoppers which emerge from the eggs that are laid in the ground. The insect feeds voraciously throughout the whole of its existence, and both in its wingless and winged stages does much damage to green standing crops of all kinds over wide areas in India. It also attacks the foliage of trees, and in fact almost every kind of green plant.

205. *ACRIDIUM SUCCINCTUM* Linn.—There is evidence to show that this is the insect which did most of the damage to standing crops in the Deccan and Konkan in the Bombay locust invasion of 1882-83. It is the locust which was reported in the Fatua district in 1877, and which has since been reported as destructive to crops in Murshidabad. It is superficially much like *Acridium peregrinum*, but belongs to the damper and more fertile regions of India.

206. *Acridium melanocorne* Serv.—One of the Acrididæ reported in connection with the Madras locust invasion of 1878.

207. *Acridium æruginosum* Burm.—One of the Acrididæ reported in connection with the Madras locust invasion of 1878. It has recently been reported to have appeared in the Vizagapatam and Cuddapah districts.

208. *Caloptenus erubescens* Walker, and *C. caliginosus* Moore.—Two of the Acrididæ reported in connection with the Bombay locust invasion



of 1882-83. A species of *Caloptenus* also has been reported amongst other Acrididæ as nipping off young chir (*Pinus longifolia*) plants in the North-West Provinces.

209. *Cyrtacanthacris ranacea* Stoll.—One of the Acrididæ reported in connection with the Bombay locust invasion of 1882-83.

210. *Oxya furcifera* Serv.—One of the Acrididæ reported in connection with the Bombay locust invasion of 1882-83.

211. *Oxya velox* Burm.—One of the Acrididæ reported in connection with the damage done by so-called locusts in Ganjam in 1891. It was also similarly reported in the same district in 1890.

212. *Puchytylus cinerascens* Fabr.—This well-known migratory locust of the Palæarctic zone was reported amongst other Acrididæ, both in connection with the Madras locust invasion of 1878, and also in connection with the damage said to have been done by locusts in Ganjam in 1890.

213. CROTOGONUS SP.—A small thick-set, brown grasshopper, which seems to be very destructive to young crops of all kinds. It bites off the young plants as soon as they appear above the ground. Specimens of it have been sent to the Museum from numerous places, and it has been reported as follows:—

- (1) as doing extensive injury in Budaon to young indigo (*Indigofera tinctoria*) plants; also attacking such crops as mash (*Phaseolus radiatus*), hájra (*Pennisetum typhoideum*), til (*Sesamum indicum*), and lobia (*Vigna Catjang*):
- (2) as destructive in Monghyr to opium (*Papaver somniferum*), indigo (*Indigofera tinctoria*), and rabi crops generally; in this district it was said to be known as *fatinga* or *gaduhya*:
- (3) as doing considerable damage in Umballa to wheat (*Triticum sativum*), barley (*Hordeum vulgare*), linseed (*Linum usitatissimum*), and rape-seed (*Brassica glauca*):
- (4) as associated with other Acrididæ in doing considerable damage to indigo (*Indigofera tinctoria*) in the North-West Provinces, where the insect was said to be known locally as *gadhao*:
- (5) as associated with other Acrididæ in nipping off young chir (*Pinus longifolia*) plants in the North-West Provinces.

214. *Catantops axillaris* Sauss.—Reported as attacking young paddy (*Oryza sativa*) plants in Howrah, where, with other Acrididæ, it is said to be known as *katforing*. An allied species, identified by Dr. de Saussure as *Catantops indicus*, has been reported as one of the Acrididæ which nip off young chir (*Pinus longifolia*) plants in the North-West Provinces.

215. *Edalus marmoratus* Linn.—Reported, with other Acrididæ, as defoliating sugarcane (*Saccharum officinarum*) plants in Cawnpore. Species of *Edalus* also have been reported both amongst the Acrididæ

which nip off young chir (*Pinus longifolia*) plants in the North-West Provinces, and also amongst the so-called locusts which did some damage in Ganjam in 1890.

216. *Epacromia dorsalis* Thunb.—Reported as attacking young kharif crops in the Upper Sind Frontier district ; also reported as injurious in Ganjam.

217. *Pacilocera picta* Fabr.—Reported as injuring young crops in Jhalawad Prant, Kathiawar, where it was said to be known as *khapedi*.

218. *Pacilocera hieroglyphica* Klug.—Reported as attacking sugarcane (*Saccharum officinarum*) in Cawnpore, where, like other Acrididæ, it was known as *bhunga* or *aukphutta*.

219. *Phymatæus punctatus* Fabr.—Said to attack crops of all kinds in Ceylon, occasionally doing some damage to coffee (*Coffea arabica*) bushes (Nietner).

220. *Heteropternis* sp.—Reported as destructive to young kharif crops in the Upper Sind Frontier district, where it was known as *khapedi*.

221. *HIEROGLYPHUS FURCIFER* Sauss.—Reported as destructive to crops in the Rajpipla state, and in the Panch Mahals, Broach, and Thana districts in the Bombay presidency ; also in the Sambalpur district in the Central Provinces, and in the Kolhapur state, Bombay. Young paddy (*Oryza sativa*) and maize (*Zea Mays*) were specially noticed amongst the crops attacked. It was also one of the so-called locusts which were reported in Ganjam in 1890.

222. *Tryxalis turrata* Linn.—Reported amongst other Acrididæ in connection with the Madras locust invasion of 1878, also with the injury done by so-called locusts in Ganjam both in 1890 and 1891.

223. *Atractomorpha crenulata* Fabr.—Reported amongst other Acrididæ in connection with the damage done by so-called locusts in Ganjam in 1891.

224. *Mecopoda* sp.—Reported amongst other Acrididæ in connection with the Madras locust invasion of 1878.

225. *Euprepocnemis bramina* Sauss.—Reported as destructive to young paddy (*Oryza sativa*) and small millet (*Panicum miliare*) in the Central Provinces ; also reported as one of the Acrididæ which proved injurious in Ganjam in 1891. A species of *Euprepocnemis* also has been forwarded with other Acrididæ as attacking paddy (*Oryza sativa*) in Howrah ; while an allied insect was reported as concerned in the Madras locust invasion of 1878.

226. Undetermined *Acrididæ* have been reported as follows :—

- (1) a locust known as the *kakotiphoring*, or paper grasshopper, reported to have done a good deal of damage to crops in the Nowgong district, Assam, in 1879 ; it has been suggested

- that the insect may have been the species *Phymateus miliaris* Linn., which is said to be common in the Khasia hills; this however requires confirmation:
- (2) insects described as "much like locusts, but green in colour with longitudinal black stripes", which are reported to have done much damage to green paddy (*Oryza sativa*) in Orissa in 1887:
  - (3) an insect, described by Mr. Bidie under the name of *Locusta coffeæ*, but from the figure obviously an Acridid, said occasionally to defoliate coffee (*Coffea arabica*) bushes in South India.

#### *Gryllidæ.*

227. *Schizodactylus monstruosus* Drury.—An enormous mole cricket, reported as injuring young tobacco (*Nicotiana Tabacum*), and other crops growing on high ground in Durbhunga, by cutting their roots. The local name given for the insect was *bherwa*.

228. *Gryllotalpa* sp.—Said to injure opium (*Papaver somniferum*) plants by cutting them off when they are considerably advanced in growth (Scott).

229. *Acheta* sp.—Said to injure young opium (*Papaver somniferum*) plants (Scott).

#### PSEUDONEUROPTERA.

##### *Termitidæ.*

230. *Termes taprobanus* Walker.—The common white ant of Lower Bengal. Very destructive to inferior timber and other dried vegetable matter, also attacking young and unhealthy plants. It is likely to be the species which has been reported as injuring sugarcane (*Saccharum officinarum*) in Cawnpore, and the tea (*Camellia theifera*) plants in Loharduggah.

231. *Termes fatalis* König.—Said occasionally to attack coffee (*Coffea arabica*) bushes in Ceylon, but to do little damage to them (Nietner).

232. *Termes* sp.—Said occasionally to damage tea (*Camellia Thea*) plants in Ceylon (Green).

##### *Thripsidæ.*

233. *Thrips* sp.—Minute black winged insects, reported as severely injuring the turmeric (*Curcuma longa*) plant in Madras, where the local name is said to be *sutta thegulu*. An undetermined species of *Thrips* has also been said to attack the opium poppy (*Papaver somniferum*) in Behar, where it was known locally as *lhi* or *lehi* (Scott). Another species has been found to damage the leaves of the tea (*Camellia theifera*) plant in Ceylon—(Green).

## [NEUROPTERA.

*Myrmeleontidæ.*

234. *Micromus australis* Hagen.—An ant lion said to attack the coffee louse (*Aphis coffeæ*) in Ceylon (Nietner).

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## ACARINA = MITES.

235. *TETRANYCHUS BIOCULATUS* Wood-Mason.—The *red spider* of tea planters, a red mite not unlike a small spider in appearance, which attacks the leaves of tea (*Camellia theifera*) bushes both in India and Ceylon, often seriously interfering with the yield of tea.

236. *Tetranychus sp.*—Said to do much damage to stored poppy (*Papaver somniferum*) seed in Behar (Scott).

237. *Typhlodromus carinatus* Green, or the *five-ribbed tea-mite*.—Said to attack the leaves of tea (*Camellia theifera*) bushes in Ceylon (Green).

238. *Acarus coffeæ* Nietner.—Said to attack the leaves of coffee (*Coffea arabica*) bushes in Ceylon (Nietner).

239. *Acarus sp.*—Said to injure the leaves of the opium poppy (*Papaver somniferum*) in Behar (Scott).

240. *Acarus translucens* (Nietner), or the *Yellow tea mite*.—By Green said to attack young tea (*Camellia theifera*) shoots in Ceylon; by Nietner thought to prey on some of the Scale insects which attack coffee (*Coffea arabica*) in Ceylon.

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I.—Table to show the Agricultural Plants and Produce reported as attacked by insects in India.

[The name of the plant is followed by the serial numbers of the insects which attack it.]

- Avena sativa* (Oat) 123, 129.  
*Bájra*, see *Pennisetum typhoideum*.  
 Barley, see *Hordeum vulgare*.  
 Bottle Gourd, see *Lagenaria vulgaris*.  
*Brassica glauca* (Rape Seed) 118, 213.  
*Brassica oleracea* (Cabbage) 171.  
*Brassica sp.* (Mustard) 129, 132, 154, 186.  
 Brinjal, see *Solanum Melongena*.  
 Cabbage, see *Brassica oleracea*.  
 Cacao, see *Theobroma Cacao*.  
*Cajanus indicus* (Tur) 50, 119, 132, 195.  
*Camellia theifera* (Tea) 8, 64, 94, 98, 99, 100, 101, 102, 106, 107, 111, 113, 114, 118, 129, 135, 146, 150, 161, 175, 177, 178, 183, 190, 192, 194, 196, 199, 200, 201, 230, 231, 232, 233, 235, 237, 240.  
*Cannabis sativa* (Hemp) 120.  
 Cardamom, see *Elettaria Cardamomum*.  
*Carthamus tinctorius* (Safflower) 132.  
 Castor-oil, see *Ricinus communis*.  
 Cholum, see *Sorghum vulgare*.  
*Cicer arietinum* (Gram) 65, 89, 105, 129, 131.  
*Chinchona sp.* 95, 175, 176, 184, 185, 192, 203.  
*Coffea arabica* (Coffee) 9, 10, 36, 54, 69, 70, 94, 102, 103, 108, 115, 116, 127, 128, 133, 134, 147, 149, 163, 169, 182, 190, 191, 192, 193, 219, 226, 238, 240.  
*Corchorus sp.* (Jute) 110, 132.  
 Cotton, see *Gossypium herbaceum*.  
 Cucumber, see *Cucumis sativus*.  
*Cucumis sativus* (Cucumber) 65.  
 Cucurbitaceæ 65, 71, 166.  
*Curcuma longa* (Turmeric) 233.  
*Dolichos Lablab* (Sembli) 120, 145.  
*Elettaria Cardamomum* (Cardamom) 88.  
*Ervum Lens* (Lentil) 125, 154.  
 Gingelly, see *Sesamum indicum*.  
*Gossypium herbaceum* (Cotton) 16, 65, 120, 138, 148, 171, 172, 173.  
 Gram, see *Cicer arietinum*.  
 Hemp, see *Cannabis sativa*.  
*Hordeum vulgare* (Barley) 129, 132, 213.  
*Indigofera tinctoria* (Indigo) 67, 187, 213.  
*Ipomæa Batatas* (Sweet Potato) 37.  
 Jowar, see *Sorghum vulgare*.  
 Jute, see *Corchorus sp.*  
 Kharif crops generally 216, 220.  
 Khesari, see *Lathyrus sativus*.  
*Lagenaria vulgaris* (Bottle gourd) 171.  
*Lathyrus sativus* (Khesari) 120, 129.  
 Leguminosæ generally 120, 132.  
 Lentil, see *Ervum Lens*.  
 Linseed, see *Linum usitatissimum*.  
*Linum usitatissimum* (Linseed) 23, 89, 129, 213.  
 Lobia, see *Vigna Catiang*.  
 Maize, see *Zea Mays*.  
 Mash, see *Phaseolus radiatus*.  
 Mustard (*Brassica sp.*) 129, 132, 154, 186.  
*Nicotiana Tabacum* (Tobacco) 19, 227.  
 Oat, see *Avena sativa*.  
*Oryza sativa* (Rice) 11, 19, 27, 48, 63, 65, 68, 92, 106, 118, 119, 120, 123, 124, 132, 140, 144, 154, 155, 170, 174, 214, 221, 225, 226.  
*Panicum miliare* (Small Millet) 225.  
*Papaver somniferum* (Poppy) 18, 19, 30, 35, 53, 120, 129, 130, 213, 228, 229, 233, 236, 239.  
 Pea, see *Pisum sativum*.  
*Pennisetum typhoideum* (Bájra) 213.  
*Phaseolus radiatus* (Mash) 213.  
*Pisum sativum* (Pea) 51, 123, 129.  
 Poppy, see *Papaver somniferum*.  
 Potato, see *Solanum tuberosum*.  
 Rabi crops generally 118, 120, 168.  
 Rape seed, see *Brassica glauca*.  
 Rice, see *Oryza sativa*.  
*Ricinus communis* (Castor-oil) 110, 119.  
*Saccharum officinarum* (sugarcane) 44, 89, 119, 136, 137, 215, 218, 230.  
 Safflower, see *Carthamus tinctorius*.  
 Sembli, see *Dolichos Lablab*.  
*Sesamum indicum* (Gingelly) 109, 213.  
 Small Millet, see *Panicum miliare*.  
*Solanum Melongena* (Brinjal) 71, 119, 137.  
*Solanum tuberosum* (Potato) 72, 129, 132.  
*Sorghum vulgare* (jowar or cholum) 4, 20, 26.  
 Standing crops generally 108, 110, 117, 120, 128, 129, 132, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 216, 217, 221, 222, 223, 224, 225, 226.  
 Sugarcane, see *Saccharum officinarum*.  
 Sweet potato, see *Ipomæa Batatas*.

Tea, see *Camellia theifera*.

*Theobroma Cacao* (Cocoa) 107, 175.

Tobacco, see *Nicotiana Tabacum*.

*Trapa bispinosa* (Water Caltrop) 65.

*Triticum sativum* (Wheat) 3, 6, 20, 23, 27, 129, 132, 144, 213.

Turmeric, see *Curcuma longa*.

Tur, see *Cajanus indicus*.

*Vigna Catjang* (Lobia), 213.

Vine, see *Vitis vinifera*.

*Vitis vinifera* (Vine) 162.

Water Caltrop, see *Trapa bispinosa*.

Wheat, see *Triticum sativum*.

Zea Mays (Maize) 137, 151, 221.

## II.—Table to show the Forest and Fruit Trees and their Produce reported as attacked by Insects in India.

[The name of the tree is followed by the serial numbers of the insects which attack it.]

*Acacia Catechu* (Khair) 15, 58.

Almond, see *Prunus communis*.

Apple, see *Pyrus Malus*.

Apricot, see *Prunus armeniaca*.

*Areca Catechu* (Suparee Palm) 197.

*Bambusa sp.* (Bamboo) 21.

*Bombax malabaricum* (Cotton tree) 61, 121.

Buk, see *Quercus lamellosa*.

*Butea frondosa* (Dhak) 33, 56.

Ceara Rubber, see *Manihot Glaziovii*.

*Cedrela Toona* (Toon) 141.

Charcoal tree, see *Sponia orientalis*.

*Citrus Aurantium*, (Orange) 90, 96, 192.

*Citrus decumana* (Pummalo). 143.

*Citrus medica* (Lemon) 90, 143, 192.

Coccanut, see *Cocos nucifera*.

*Cocos nucifera* (Coccanut) 12, 28, 38, 59, 91, 198, 202.

Cotton tree, see *Bombax malabaricum*.

Date, see *Phoenix dactylifera*.

Dead wood generally, 230.

Deal, see *Pinus*.

*Dendrocalamus Hamiltonii* (Hill Bamboo) 29.

Dhak, see *Butea frondosa*.

*Eryobotrya japonica* (Loquat) 87.

*Erythrina suberosa* (Roongra) 61.

*Ficus Roxburghii* (Fig.) 154.

Gall-nut tree, see *Terminalia Chebula*?

Guava, see *Psidium Guava*.

Hill Bamboo, see *Dendrocalamus Hamiltonii*.

Hill Oak, see *Quercus*.

Jingham, see *Odina Wodier*.

Khair, see *Acacia catechu*.

Lemon, see *Citrus medica*.

Loquat, see *Eryobotrya japonica*.

Mahogany, see *Swietenia Mahagoni*.

*Mangifera indica* (Mango) 17, 31, 104, 112, 139, 164, 179, 188, 189.

*Manihot Glaziovii* (Ceara Rubber) 191.

*Moringa pterygosperma* (Soangna) 61.

*Morus* (Mulberry) 32, 126.

Mulberry, see *Morus*.

*Odina Wodier* (Jingham) 56.

Orange, see *Citrus Aurantium*.

Peach, see *Prunus persica*.

*Phoenix dactylifera* (Date) 428.

*Pinus excelsa* 46.

*Pinus longifolia* (Chir) 17, 32, 49, 208, 213, 214.

*Pinus sp.* (Deal) 58.

Pomegranate, see *Punica Granatum*.

Poplar, see *Populus euphratica*.

*Populus euphratica* (Poplar) 17, 93.

*Prunus armeniaca* (Apricot) 181.

*Prunus communis* (Almond) 181.

*Prunus persica* (Peach) 165, 181.

*Pyrus Malus* (Apple) 180.

*Psidium Guava* (Guava) 22, 87, 96, 192.

Pummalo, see *Citrus decumana*.

*Punica Granatum* (Pomegranate) 87, 142.

*Quercus incana* 49.

*Quercus lamellosa* (Buk) 118.

*Quercus pachyphylla* 42.

*Quercus sp.* (Hill Oak) 7, 45.

Roongra, see *Erythrina suberosa*.

Sáj, see *Terminalia tomentosa*.

Sâl, see *Shorea robusta*.

*Salix tetrasperma* (Wild Willow) 60.

Sandalwood, see *Santalum album*.

*Santalum album* (Sandalwood) 25, 94.

*Shorea robusta* (Sâl) 13, 41, 49, 55, 56, 57, 99, 111, 118.

*Sponia orientalis* (Charcoal tree) 96.

Soangna, *Moringa pterygosperma*.

Supari Palm, see *Areca Catechu*.

*Swietenia Mahagoni* (Mahogany) 40, 106.

*Tamarindus indica* (Tamarind) 52.

Teak, see *Tectona grandis*.

*Tectona grandis* (Teak) 14, 57, 58, 62, 96, 132.

*Terminalia Chebula* ? (Gall-nut tree) 97.

*Terminalia tomentosa* (Sáj) 57.

Toon, see *Cedrela Toona*.

Wild Willow, see *Salix tetrasperma*.

*III.—Table to show the miscellaneous products reported as attacked by insects in India.*

[The name of each product is followed by the serial numbers of the insects reported to attack it.]

Beer Casks 43, 44.

Convolvulaceæ 66.

*Croton Tiglium* (Croton-oil plant) 191.

*Crocus sativus* (Saffron) 19.

Garden plants 123.

*Hibiscus Abelsonchus* (Musk Mallow) 171.

*Hibiscus*, sp. 34.

Kibu, see *Strobilanthes pectinatus*.

*Lagerstræmia indica* 97.

Leather 5.

Musk Mallow, see *Hibiscus Abelsonchus*.

*Rosa* sp. (Rose bushes) 97.

Saffron, see *Crocus sativus*.

Ships' Biscuit 4, 20, 24.

Silk Cocoons 5.

Silk-worms 76, 157, 158, 167.

*Strobilanthes pectinatus* (Kibu) 39.

Warehouse goods 3, 4, 5, 6, 18 19, 20, 24  
27, 30, 50, 51, 52, 151, 152, 153, 154,  
230, 236.

Woollen material 152, 153.

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CALCUTTA,  
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